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A Discourse denying the Præ-existence of Alcalizate or Fixed Salt in any Subject, before it were expos'd to the Action of the Fire: To which is added a Confirmation of an Assertion, deliver'd in Numb. 101. p. 5. §. 6. of these Tracts, viz. That Alcalizate or Fixed Salts extract'd out of the Ashes of Vegetables, do not differ from each other: The same likewise affirm'd of Volatil Salts and Vinous Spirits; by the learned Dr. Daniel Coxe.

THE *Alcalizate* or *Fix'd* Salts of Plants, extract'd out of their Ashes after Incineration, or out of Tartar calcined; do, in my Apprehension, neither *præ-exist* in the Vegetables that afford them, before they were expos'd to the Action of the Fire; nor do they differ *considerably*, (I am certain, not *sensibly*) from each other.

The *former* part of this Position may be thus made out:

1. I never yet found, that any Vegetable (or indeed Animal, or Mineral) Substance did in the least Measure manifest to the Taste, or by its Effects, that it contained any such Salt. Many Plants and Roots, lightly bruised, affect the Eyes and Nose after the manner of *Volatil* Salts, and several do bite the Tongue, and strike upon the Palate. Some Herbs yield a copious *Volatil* Salt immediately after they are press'd by a considerable degree of Heat: And many sorts of Earths do abound therewith; so that it is highly probable, they do often actually exist in Vegetables, in the very same Form, wherein they appear unto us upon Distillation from the Herbs themselves, or from Soot. And that *Acid* Salts do really exist in many Plants, is display'd by their Tastes and Effects. They may also be obtain'd *without* Fire, or any artificial *Analysis*; as is evident in Tartar, and the reputed Essential Salts of many Plants; in Verjuice, Vineger, and Verdegris, whose Acidities may be concentr'd, and made to appear in a dry Form. Now did *Alcalies* exist in the Plants before the *Analysis*, especially so copiously as they sometimes appear afterwards, certainly they would betray themselves by some visible

visible sensible Property, or other symptom of their Presence.

2. Did *Alcalies* præ-exist in Plants, probably Animals, whose sole Food they are, would also abound therewith; whereas on the contrary, we do not find the least Footsteps thereof, either in Blood, Urine, Bones, Horns, &c. which do all abound with *Volatil* Salts; nor in some other Parts, Excrements, and Juices, that afford store of Acidity, which may frequently by coagulation be brought to a Saline form or consistence. Nor can it reasonably be pretended, that the Ferment of the Stomach and other Parts, several Digestions and repeated Circulations, have alter'd its Property, and at length render'd it *Volatil*. For, *first*, *Alcalies* seem to be of a very fixed Nature, and are not easily volatilized: And daily Experience will evince, that the Chyle doth not in the least participate, either in Taste, or any other Property, with *Alcalisate* Salts. Besides, Herbs taken out of the *Omasus* of ruminating Animals, without any further Digestion or Preparation, yield a *Volatil* Salt, when fermented or putrified in the open Air, without Additament.

3. Most Vegetables, whether Woods or Herbs, if burnt whilst they are green, and with a smothering fire, yield Salts which are far enough from *Alcalisate*; being either Neutral or Acid; or, to speak more properly, Tartareous: For, they do almost exactly resemble purified Tartar; and distilled, yield the very same Substances. Indeed, some few Herbs, such as *Satureja*, *Rosemary*, &c. which abound with a sprightly volatil Oyl, if they are well dried, upon simple incineration yield an *Alcalisate* Salt: So do some dry Woods. But, that they are produced by the Fire, and not separated, I shall anon prove from Experiments, I think, unquestionable and unanswerable.

4. In the most natural Method of analysing Plants, which is by Fermentation or Putrefaction without additaments, or the intervening of a suspicious Analyser, we receive Oyl, Acid Spirit, and *Volatil* Salt copiously; all which did evidently præ-exist. But, if the Herbs are perfectly or intirely putrified, little or no *Alkali* can be extracted from them; as
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neither from rotten or putrified Wood ; the active Salts, by whose combination the Alkali is produced, being either expired or evaporated.

Next, I am to enquire, How the Fire produces this *Alkali* : Whether by the changing of one single præ-existing Principle ; or by enabling any among them to make so notable an alteration upon, or in the other ; or lastly, Whether it is effected by the Union of two or more active Principles, which thereby become different from what they were before the said Combination ?

I shall not at present trouble you with the Reasons, Experiments, and Observations, which have induced me to reject the former ; but, briefly suggest those, which encourage and dispose me to believe and assent unto the latter : So that this is my Position ; That *Alkali Salts do result from the Combination or Union of the Saline and Sulphureous Principle*. But, whether it is the *Volatil* or *Acid* Salt, which combines with the Oyl or Sulphur, is now the Subject of our Inquiry. The ensuing Considerations seem to determine in favour of the *Acids*.

First, Tartar, which is sensibly Acid, and from which a Volatil Salt cannot be separated by any commonly known Method, by bare Calcination becomes a strong and perfect *Alkali*. *Secondly*, Niter, an undoubted Acid with a small proportion of Mineral or Vegetable Sulphur, is converted into a genuine fiery Alkali. *Thirdly*, Niter, which is made by the affusion of an Acid Spirit upon an Alkali, may be almost totally distill'd into an Acid Spirit, there appearing not the least Footsteps of a Volatil Salt, and scarce any of the Alkali, out of which it was chiefly produced.

But these are very weak and inconsiderable, compared with Arguments, which *necessitate* me to believe, that it emerges from the Union of the *Volatil* Salt with the Oleaginous or Sulphureous Principle. For,

1. There seems to be a great Contrariety between *Acids* and *Alcalies* : Being mix'd, they heat, fight and mortify each other ; whatsoever one dissolves, the other precipitates : Whereas, were the Salt of *Alcalies* of a Nature approaching
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to Acids, they would more plainly unite without that violent contention, which usually ensues.

2. Alcalies and Volatil Salts agree in most Properties, excepting their different Degrees of Gravitation. They are both Diuretical and De-obstruent; they both dissolve Sulphureous Bodies; agree in their contrariety to Acids, but mix together quietly without noise, heat, ebullition, or impairing each others Vertues, and are easily separable; the same in Quantity and Quality they were before mixture.

3. Tartareous or Essential Salts of Vegetables cannot become Alcalies, until their Acidity be driven away; during which Operation the Volatil Salts and Oyl uniting, become more ponderous than the Acid, which before did gravitate more than either of them in their separate State: So that such a degree of Fire, as will wholly dissipate the Acid Spirit, cannot elevate the more ponderous Alkali. Not but that, contrary to what is commonly asserted, the most fix'd Alkali may be sublimed to great height without additaments, by any intense degree of Heat: For, I have frequently reduced a Pound thereof unto three or four Ounces, and recover'd a considerable Proportion, which was caught in well-contriv'd Vessels, some Yards above the Crucible; little, if at all, alter'd from what it was immediately before it suffer'd this violence. Upon this Account chiefly it is, that *Soot* yields some small Quantity of an Alkali, especially that nearest the *Focus*.

4. Alcalies may be divided into Oyl and Volatil Salt by facil and natural Methods of procedure. I my self have many Ways effected this in Part: And a very worthy Person, in whom I can perfectly confide, assur'd me, he hath frequently resolv'd the whole Body of Alcalies into the two distinct Substances of Volatil Salt and Oyl; receiving of the latter a small Proportion: Which is also confirm'd by those Trials I have made on the same Subject,

I could suggest many more Arguments and Experiments; but these being sufficient, and, I think, indissoluble, I proceed to confute the Pretensions of *Acid* Salts to an Interest in this new Production. *First*, What concerns *Tartar*, its Acidity is driven away in great Quantity before it can become Alcalifate; and a Volatil Salt may, to my Knowledge, be by divers Methods separated from it. *Secondly*, As to *Niter*, though that in Distillation yields an Acid Spirit, yet it abounds also in Volatil Salt; as I could demonstrate from the Manner of its Generation, and from irrefragable Experiments. And besides, perhaps in the operation of the Sulphur on the Acid Salt, supposing it such, there is a comminution of its Parts, and thereby that made a Volatil Salt which was before Acid, only Magnitude discriminating between them: And that they are often thus produced by each other, I could fully and at large evince.

Having dispatch'd this, I cannot but take Notice, that I am credibly inform'd, That many Persons of no ordinary Repute for their Skill in Chymistry, and other Arts subservient to Experimental Philosophy, have been pleas'd to censure in an unusual measure of Severity, an Assertion, accidentally dropt from my Pen, in a Discourse concerning the *Volatil Salts of Vegetables*, in *Numb. 101.* of the *Ph. Transactions*; which although circumscribed by a *Parathesis*, and an Alien to the main Design and Scope of my Undertaking, yet was so far from being thereby protected, that it hath sustain'd the brunt of many unkind Reproaches, and been represented as a Position without Foundation in Reason or Experience. I shall not endeavour by an elaborate Apology, to vindicate my self from that Disgrace, whereunto a Charge of being Inconsiderate, Un-judicious, or (which is still worse) Un-sincere, must necessarily expose me; but shall nakedly and simply rehearse, without Flourishes, Digressions or Circumbolition, the Reasons, Observations and Experiments, which induced me to embrace

brace and publish an Opinion, so contrary to what hath been hitherto generally received: And I shall then appeal unto all un-prejudiced, impartial, and intelligent Persons, Whether the arraign'd Position be ungrounded and temerarious; or rather, Whether the Arguments I have produced in its Favour and for its Confirmation, do not render it highly probable, and excuse any, who shall give it entertainment, from suspicion of Levity, or too prompt Credulity.

My Assertion was, That *Alcalifate or Fixed Salts extract- ed out of the Ashes of Vegetables, do not differ from each other; as neither their Vinous Spirits; yet with this restriction, if they were highly rectified or purified.* And that I may further manifest, I do not distrust my Cause, I shall add, *Not Volatil Salts, not only of Vegetables, (which I did heretofore faintly affirm) but even those yielded by Animals or Minerals, with the before-mention'd limitation of due Purification.*

First then, I say, That Salts perfectly *Alcalifed*, differ not from each other in *sensible*, nor, (so far as I have had opportunity to enquire) in *hidden*, Properties. It hath been a constant and general Perswasion, that many Fix'd Salts do retain, some, at least, the Specifical Properties of those Vegetables, out of whose Ashes they were extract- ed. The Salt of *Wormwood* and *Mint* are said to be stomachial; that of the greater *Celandine* proper for Ictericks; those of *Broom*, *Ash-Keys*, *Elder*, *Bean-Stalks*, &c. Diuretical; of *Rosemary*, *Sage*, &c. Cephalick; and others, (too many now to enumerate,) which are thought to be endow'd with very different Medicinal Properties. I am not very forward to question and quarrel with Opinions and Maxims establish'd by universal Consent, and confirm'd by the Experience of many Ages, unless I have sufficient Reason to distrust their Veracity and Validity. In the present Case, the perswasion of the Antients, and the Position,

which I shall endeavour to illustrate, though at the first Appearance they seem diametrically opposite, may be easily reconciled. I formerly declared, that most Vegetables, burnt whilst green or moist, and with a smothering Fire, yield a kind of a Neutral Salt, which may be call'd *Tartareous*, and sometimes not improperly *Essential*, many of them retaining the Vomitive, Purging, Sweating, Diuretical, Opiate, or other general, and perhaps some specific Properties, wherewith the Plants were enobled which produced them. Now, *whether* 'tis some small Quantity of the *Essential Oyl*, which mix'd with the Saline Principle, renders it so variously Medicinal, the Essential Oyles of Plants being manifestly as 'twere a *Compendium* of the Plant, which they do equally exactly resemble in Smell, Taste, and other Qualities: Or, whether those Virtues are the result of the *crasis* and mixture of the several Principles; certain I am, that, after the Oyl is evaporated by an intense Heat, or the *Crasis* disturbed by avolation of some Parts, and new Combinations of what remains, farewell all Specific Qualities, and consequently all other Differences, than what Purity and Impurity, and several degrees of heat may occasion; some being more white and fiery than others. Now, some Salts are much more easily depriv'd of their Acid and Oily Parts than others; and in some, on the contrary, the Oyl is of so fix'd a Nature, or rather so closely combined with the other Principles, that it must be a very intense Heat which can disjoin them, and thereby reduce the Salt to the common standard or aggregate of Qualities, wherein all Alcalies agree.

The industrious *Tachenius* does somewhere pretend to demonstrate, that there is a *real* difference between the *Alcalies* of different Plants; which he would prove by the various Effects they have upon a Sublimate dissolved in common Water. But this is easily resolv'd by what I before suggested; as also by an easy obvious Experiment.

ment, which may at any Season in any Plant be readily proved. Take what Wood or Plant you please, burn it green; the Salt being extracted out of the Ashes, will, according to the different Degrees of fire whereunto it shall successively be exposed, variously influence the Mercurial Solution, the several Precipitats differing no less from each other, than when made with the Salts of different Plants.

This is also most evident in *Tartar*, which, the less and more gently it is calcined, the more Salt it yields; and on the contrary, a much smaller Proportion, if suddenly and with the highest degrees of Heat. That which is prepar'd by the former Method, is mild and gentle, its Taste approaching somewhat towards that of Acids; whereas the other, which hath pass'd through the violence of fire, hath not the least affinity therewith, and can almost as little be endured by the Tongue as a live coal of actual Fire. And there being very many degrees of Heat, whereunto the *Tartar* may be successively exposed according to the said Degrees, the Manner of applying it, space of Time, and Substances employed in its Calcination; the Result will be different, and produce different Effects: And the very same sort of *Tartar* will oftentimes become sensibly different upon these Methods of Procedure, and produce most of the Appearances mentioned by *Tachenius*. And sometimes several Parcels of *Tartar*, which seem to our Taste and Eye calcined to the same Degree; yet the Operations in nice Experiments are frequently various. And to me it doth not seem so very wonderful, that many Concrets do really differ, which to the Senses appear simple and uniform; of which many Causes may be assigned. A great number and variety of Instances might be here introduced to clear this Truth, if it were not already sufficiently known and believed.

But to proceed where I digressed; What I have asserted is confirmed by the great variety, which is most visible in
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Pot-ashes: Some being highly Alcalifate are fiery hot; others, cold, watry, nitrous to the Palate, and no less weak in Effects than Taste; whereof Soap-boylers, Dyers, and other Mechanicks are very sensible. All which proceeds from the Woods, being, when they are burnt, green or dry; from their abounding with Oily, Aqueous, or Ace-tous Parts; as also from the several Degrees of Heat im-ployed in their Production. Those who make Glafs, and especially the finer Sorts thereof, complain, that they can-not with the same quantities and proportions of Ingredi-ents, always produce the same sort of Glafs: Which they, not without Reason, ascribe to the Differences in their Ashes. This must necessarily often happen according to the lately mentioned *Hypothesis*.

The remainder of this Discourse, affirming the like of *Volatile* Salts and *Vinous* Spirits, with what hath been said of *Alcalifate* Salts, we refer to the next Month; the room left in this Tract being to be employ'd, as is usual, in giving an Account of some Books.

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